

REMARKS

Claims 1, 4, 8, 11-15, 18, 22, 25-27, 30, 31 and 33 have been amended to improve readability. Claims 1-33 are currently pending.

Claim Objections

Claims 14, 26 and 31 have been objected to because of informalities. Claim 14 has been amended to conclude with a period. Claims 14, 26 and 31 have been amended to change from SiO_x to SiO, where the support for the change is found in the specification, on page 8, paragraph [0021], line 6. No new matter has been introduced. Accordingly, Applicant respectfully requests that the objection to claims 14, 26 and 31 be withdrawn.

Claim Rejections – 35 USC §103(a)

Claims 1-4, 8, 13-18, 22 and 25-33 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Song (U.S. Patent Application Publication 2002/0076142 A1)

Regarding claims 1, 15, 27 and 33, the Office has stated that "Song discloses an integrated optical switch/variable optical attenuator, comprising...a first temperature control element...change the phase of the liquid crystal, said change producing differential refractive index loading of the optical Y-branch waveguide...." Applicant respectfully disagrees.

Claims 1, 15, 27 and 33 have been amended to improve readability and for emphasis of original recitations. The amended claims 1 and 15 include a recitation **"change the phase thereof from nematic to isotropic, thereby producing differential refractive index loading of the channel waveguide core."** The amended claims 27 and 33 include recitations **"to produce differential refractive index loading to said solid medium"** and **"differential refractive index loading is generated to the input and output branches,"** respectively. As disclosed in these recitations, the present invention teaches changing the phase of liquid crystal to generate differential refractive index loading of the channel waveguide core. In

marked contrast, Song's system includes a heating element used to change the refractive index of the active material so as **to control the optical reflectivity of the active material**. Also, in Song, there is no finding that would motivate a skilled artisan to heat the liquid crystal **for the purpose of producing differential refractive index loading of the channel waveguide core**.

Since none of cited references, taken alone or in combination, teach or suggest all the limitations of the claimed invention, Applicant respectfully submits that the Office has not established a *prima facie* case of obviousness and claims 1, 15, 27 and 33 are patentable. Each of claims 2-4, 8, 13-14, 16-18, 22, 25-26 and 28-32 depend from a corresponding one of claims 1, 15 and 27, rendering them also patentable. Accordingly, Applicant respectfully requests that the rejection to claims 1-4, 8, 13-18, 22 and 25-33 be withdrawn and an indication of allowance be made.

Regarding claims 1, 15, 27 and 33, the Office has admitted that Song does not explicitly state the switching between the nematic and isotropic phases. Then, the Office has asserted that "one of ordinary skill in the art would have found it obvious to incorporate a liquid crystal material in which the phase is changed from nematic to isotropic in the invention of Song, since such liquid crystal materials are known thermo-optical liquid crystal materials in the art and Song suggest using a thermo-optical liquid crystal materials." Applicant respectfully disagrees.


Claim 5 of Song is drawn to a "**homogenous** active material." As a liquid crystal is homogeneous only in its isotropic phase, claims 5 of song indicates that the active material (or, equivalently, the liquid crystal) of Song is to remain in the isotropic phase, i.e., Song teaches away from switching phases between nematic and isotropic. In contrast, the present invention teaches changing/switching phases from nematic to isotropic phases, as disclosed in claims 1, 15, 27 and 33. Thus, it would not be obvious to a skilled artisan to modify the teachings of Song in order to change the phases of the liquid crystal as disclosed in the present invention. Accordingly, Applicant respectfully submits that the Office has not established a *prima facie* case of obviousness and claims 1, 15, 27 and 33 and their dependent claims 2-4, 8, 13-14, 16-18, 22, and 25-26, are further patentable over Song.

It is noted that there is a marked structural difference between the present invention and Song's system. In Song's system, the liquid crystal is disposed at a junction between input and output waveguides. In contrast, the present invention teaches trenches filled with liquid crystal, where the trenches are laterally spaced apart from the waveguide. For emphasis of this structural difference, claims 1 and 15 have been amended to recite **"a first elongated trench formed in said cladding medium and filled with a first liquid crystal material and laterally spaced apart from said channel waveguide core, the longitudinal axis of said first trench being disposed along one side of said input branch and said first output branch opposite to said second output branch."** Claims 27 and 33 have been also amended to recite **"liquid crystal material [that] is contained in at least one trench laterally spaced apart from the input and output branches [said solid medium]."** Applicant respectfully submits that these recitations further differentiate the present invention from Song's system and clearly make claims 1, 15, 27 and 33 and their dependent claims 2-4, 8, 13-14, 16-18, 22, and 25-26 more patentable over Song.

Respectfully submitted,

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